

SESAR¹: towards the new generation of air traffic management systems in Europe

Patrick Ky, European Commission, DG Transport & Energy²
Bernard Miaillier, EUROCONTROL²

Context

Air Traffic Management in Europe

The pages of European airspace history are still being written.

Historically, air navigation services were provided within the boundaries of different European States by governmental organisations; some were even under the auspices of Ministries of Defence. Over the years this situation has changed. The change was brought about by several factors: civil air traffic growth; the maturation of the route charges system through which air navigation services, in Europe, are fully funded directly by aircraft operators, and the general evolution in the governance of public services. These changes have facilitated a trend towards corporatisation or even privatisation in air navigation service provision. The result remains, however, a patchwork of service provision areas with few exceptions based mainly on national boundaries and of providers governed by different institutional arrangements, ranging from state departments to fully privatised companies.

The Single European Sky Legislation

The European Union's Single Sky legislation, adopted in 2004, sets out an in-depth institutional reform of Air Traffic Management (ATM). It enforces the principle of separation, within Member States, between regulatory activities and service provision; establishes the ground for substantial cross-border operations, and sets up the framework for operational and technical interoperability standards in Europe. Moreover, the Single European Sky confers extensive competencies to the European Commission, using "comitology" principles, under which the European Commission discusses with the Single Sky Committee, made up of Member States and consults the stakeholders through the Social Dialogue and the Industry Consultation Body (ICB). The ICB consists of stakeholders from industry, including aircraft operators, airports, staff representatives, manufacturing industry and air navigation service providers. It is worth noting that the US FAA and AIA (Aerospace Industries Association) participate in the ICB.

These competencies in particular give the European Commission the possibility to mandate equipage of specific technologies for aircraft flying in the European Union's airspace, or for ground systems. The Single Sky legislation also offers the possibility to earmark in the route charges a specific contribution to "projects of common interest".

The Single Sky legislation therefore enables the aeronautical community in Europe to solve one of the most important shortcomings for efficient implementation of a modernised ATM system: lack of cohesive decision-making and commitment by the many stakeholders.

The need for transformation

Air traffic is forecast to grow in Europe at an average rate of 3 to 5% per annum for the next twenty years. Overall, air traffic in Europe will have doubled by 2025. For some city pairs traffic will increase by larger factors.

This expected growth raises a natural question about the ability of the ATM system to at least double its current capacity. Even if history has witnessed such a spectacular capacity increase over the last twenty years, this was done mainly through new operational procedures (airspace design, enhanced coordination, traffic management, etc.). One must acknowledge that, as far as technologies are concerned, ATC remains principally operated the way it was operated twenty years ago. The current technologies are also beginning to face versatility, perennity, and scalability problems, which contribute to an overall concern on the suitability for accommodating more traffic while maintaining high levels of air transport safety.

It is now widely recognised that, in order to sustain safely and efficiently the expected air transport growth, a 'paradigm shift', supported by state-of-the-art and innovative technologies, is necessary.

The challenge: make change happen

A challenge has also been to achieve the optimal overall functioning of the network, which consists of the aircraft operators, airports and ATM.

In this network, the processes and decisions of many different actors and their competing objectives interact closely, both at the planning and operational stages, requiring high levels of information-sharing and cooperation.

A good illustration of these difficulties can be seen in the Aeronautical Telecommunications Network (ATN) technologies, which were standardised by ICAO in the 1990s, but have not yet been implemented: they risk being overtaken by more state-of-the-art telecommunications technology. Successful implementation would have required the simultaneous deployment of airborne and ground parts of the network. Instead, one could observe every actor waiting for the other to invest first - a situation that was all the more protracted as there was no immediate operational return offered to early investors.

In contrast, we have the successful implementation of Reduced Vertical Separation Minima (RVSM). This EUROCONTROL programme was plainly linked to a clear and persuasive business case. It was well managed, gained universal acceptance and was implemented over the whole of Europe at one single point in time.

This decision-making problem is even more serious in Europe where 25 different air navigation service providers may have different business strategies and therefore different modernisation plans.

These observations are not new; they triggered a number of initiatives from industry, EUROCONTROL and the European Commission. The notion of a European ATM Master Plan emerged as recommendations slowly began to converge. What was needed was a political impulse to bring all the strands together - and this was brought about with SESAR.

SESAR will federate resources and increase the coordination of planning, development work, and decision-making in order to build the new ATM infrastructure which will increase air transport safety in Europe and sustain air traffic growth in the coming years.

SESAR: the modernisation programme for European ATM

SESAR has been divided into two main Phases:

- The Definition of a European ATM Master Plan (up to the end of 2007), leading to and followed by
- Implementation, phased over the 2008-2020 period.

SESAR Definition Phase

The SESAR Definition Phase will deliver a European ATM Master Plan up to 2020 and the work programme to execute it. It will also identify the actions and means to make change happen. This ATM Master Plan will formulate operational concepts and propose new systems, as well as define the roadmap for their implementation.

The SESAR Definition Phase is a collaborative effort of the whole aviation industry, co-financed by EUROCONTROL and the European Commission. It will bring together the full range of stakeholders and they will define, agree, and commit to the results of the ATM Master Plan.

The Definition Phase is a two-year project where aviation industry efforts are supplemented by EUROCONTROL Agency expertise. The total cost of the project has been estimated to be around sixty million euros, representing a team of about 200 persons working full time for two years, on the basis of a contract awarded on November 17, 2005 by EUROCONTROL to a consortium of thirty companies.

SESAR Implementation Phase

The synergy between EUROCONTROL and the European Commission will be a guarantee for the success of the implementation phase of SESAR.

The implementation of the Master Plan will start in 2008 and will organise the introduction of new technologies, resulting in a safe and efficient high-performance air transport system with minimum environmental impact by 2020. For the successful transition to 2020, it is necessary to perform, in parallel, a range of tasks supporting the short-, medium- and long-term developments. These range from innovative research to actual implementation.

However, from a programme perspective, the Implementation Phase is articulated around two main steps:

- **Development (2008-2013)**, including the development of those technologies upon which the new generation of systems will be founded. It will allow major functional advances, in particular in terms of automated assistance or task distribution between the air and the ground.
- **Deployment (2014-2020)**: large scale deployment of the new systems and generalised implementation of associated functionalities. The resulting ATM system will represent the anticipated new generation.

The expected SESAR effect

SESAR will reduce fragmentation in Europe; it will synchronise and integrate plans and actions.

There is a general agreement that the current fragmentation in the European sky translates into unnecessary costs and inefficiencies. Less fragmentation of the European ATM systems means more fluid and economic traffic flows, more compatible system solutions, and a simplified regulatory framework.

SESAR means that the plans to develop the European air transport will be synchronised (both in a geographical sense and from a system – ground and air- perspective), and integrated from research to operations. In practice real issues will be more clearly identified and addressed more completely; research results will be exploited to their full potential and deployed more expeditiously, thereby allowing more cost-efficient use to be made of the important resources spent by the different actors (e.g. European Community, EUROCONTROL, aircraft operators, industry). This is of great value in an industry that faces strong competition and is under much pressure to save costs wherever it can. In creating SESAR, the future European ATM landscape is addressed consistently and holistically from an operational and a technical point of view. By jointly defining SESAR, the ATM actors will address all these difficult issues together.

SESAR governance: a key for success

In the definition phase, most of the work will be performed by a consortium comprising a representative sample of air traffic management stakeholders: aircraft operators, including GA; air navigation service providers; equipment manufacturers; professional organisations; airports; military, etc. Non-European companies will also participate in the work.

For the implementation phase, the same level of commitment and buy-in from industry is needed. For this reason, the European Commission has proposed to the Transport Council and the European Parliament that a separate organisation for the management of SESAR be set up. This will take the form of a joint undertaking between the European Community and EUROCONTROL and, on its administrative board, contain industry representatives, including aircraft operators, air navigation service providers, equipment and systems manufacturers, airports and staff representatives. The mission of this joint

undertaking will be to combine resources from the Community and EUROCONTROL, as well as from other non-EU states, putting them at the service of a consistent and programme-oriented SESAR initiative. This Joint Undertaking is comparable to the US Joint Planning and Development Office, except in that it has more focus on the execution of the programme. Responsibility for the strategic and regulatory aspects will still lie with the EU Member States and the European Commission, in conformance with the Single European Sky legislation.

SESAR and NGATS: air transport seen from a global perspective

Air transport is a global industry. This means, in particular, that the two densest air traffic regions need to be fully interoperable.

Europe and the USA face the same challenges for the transformation of their ATM systems in order to be able to sustain air traffic safety and efficiency. NGATS on one side, SESAR on the other, are similar initiatives, and need to be coordinated in order to make sure that technology implementation is synchronised across the Atlantic Ocean. This has to be done institutionally, through cooperation agreements between the FAA and its European counterparts, and also at an industrial level. On the latter aspect, the SESAR definition phase will incorporate US industry contributions. Reciprocal arrangements should be enabled within NGATS.

The FAA and EUROCONTROL have a Memorandum of Cooperation (MoC). In the framework of this MoC, cooperation takes the form of joint Action Plans, which have already made a significant contribution to the definition of a future globally interoperable ATM system. For instance, in the short-term, an amendment has been suggested to ICAO R/T phraseology; substantial inputs have been made to the ICAO Global Operational Concept and to a performance-based approach to ATM; a common validation methodology has been defined as have the Airborne Separation Assistance System (ASAS) functions. Work is ongoing on aeronautical information exchange models; surface management systems; wake vortex, etc. It is worth mentioning the current joint study of the Future Communications Systems. This study stands out from the rest in that it was initiated unusually early in the upstream life cycle with a view to reaching a fully interoperable communications solution for the future. In the SESAR Definition Phase, it is expected that the MoC will form the backbone for maintaining coordination with similar US developments. There will be an exchange of information on needs and

solutions, as well as consultation and feed back from both sides.

As a complement to this agreement between the FAA and EUROCONTROL, the European Commission is currently discussing a Memorandum of Understanding with the FAA, by which the two institutions, with their respective tasks and responsibilities, will endeavour to reduce duplication of work and further coordinate NGATS and SESAR.

The interoperability and synchronisation of deployments will also need to be considered on a global scale. There is, for example, an established link and potential synergies between the deployment of Mode S surveillance in Europe and of ADS-B in Australia.

This will be done under the umbrella of ICAO in its activities on both global and regional levels, with active participation from EUROCONTROL. There is a clear need for airspace users to have a seamless and interoperable ATM in all countries. Cooperation with airspace users associations, like IATA is, therefore, essential in this respect: it begins with a clear understanding of operational needs. IATA, together with other airspace user organisations, is directly involved in the SESAR Definition Phase and should be given a significant voice in the Implementation Phase arrangements.

Conclusion

SESAR is just about to start with both its Definition Phase and the initial steps in setting up the governance and processes needed to manage the Implementation Phase. It is not yet time to draw conclusions, but rather to mobilise energies for this ambitious programme. One of the conditions for its success will be the degree to which the different actors in the ATM system are able to interact and dovetail their operations.

SESAR is a challenging undertaking which, for the first time ever at this international level, will assemble all stakeholders around a common goal. The cooperation between the European Commission and EUROCONTROL is fundamental for the success of this initiative

The Single European Sky vision is the goal in question and is within reach. With SESAR, and with the commitment of the whole aeronautical community, it will become reality.

Patrick Ky

A graduate engineer from *Ecole Polytechnique* in Paris, the French Civil Aviation School and

Social Sciences University in Toulouse, and the *Massachusetts Institute of Technology*. He held different positions respectively in the French Civil Aviation Authority, a private consulting company, and EUROCONTROL. He was seconded to the European Commission in 2004 to work on SESAR. Patrick was also the ATM team *rapporteur* for the Advisory Council for Aeronautics Research in Europe (ACARE).

Bernard Miaillier

A graduate engineer from the *Ecole Polytechnique* in Paris and the French National Civil Aviation School in Toulouse: "*Ingénieur en chef des Ponts et Chaussées*".

After a year's air traffic control experience at the Paris Air Traffic Control Centre and eight years of R&D execution and management in the French Air Navigation Directorate, he joined EUROCONTROL in 1987 and since then, has been involved in future ATM/CNS concept definition and implementation planning as well as in management and co-ordination of R&D programmes. He led the development of the European ATM2000+ Strategy.

He is currently Head of the "European ATM Strategy and Convergence" Business Division and is the SESAR Project Manager at EUROCONTROL.

¹ Single European Sky ATM Research

² Any opinions set out in this paper only reflect the views of the authors and do not commit the European Commission or EUROCONTROL.